Air Pollution In India

In [1]:

```
# This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python docker image: https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load in

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.plotly as py
%matplotlib inline
plt.rcParams['figure.figsize'] = (10, 7)

# Warnings
import warnings
warnings.filterwarnings('ignore')

# Input data files are available in the "../input/" directory.
# For example, running this (by clicking run or pressing Shift+Enter) will list the files in the input

import os
print(os.listdir("../input"))

# Any results you write to the current directory are saved as output.
```

```
['data.csv']
```

In [2]:

```
data=pd.read_csv('../input/data.csv',encoding = "ISO-8859-1")
data.head()
```

Out[2]:

	stn_code	sampling_date	state	location	agency	type	so2	no2	rspm	spm	location_monitoring_station	pm2_5
0	150	February - M021990	Andhra Pradesh	Hyderabad	NaN	Residential, Rural and other Areas	4.8	17.4	NaN	NaN	NaN	NaN
1	151	February - M021990	Andhra Pradesh	Hyderabad	NaN	Industrial Area	3.1	7.0	NaN	NaN	NaN	NaN
2	152	February - M021990	Andhra Pradesh	Hyderabad	NaN	Residential, Rural and other Areas	6.2	28.5	NaN	NaN	NaN	NaN
3	150	March - M031990	Andhra Pradesh	Hyderabad	NaN	Residential, Rural and other Areas	6.3	14.7	NaN	NaN	NaN	NaN
4	151	March - M031990	Andhra Pradesh	Hyderabad	NaN	Industrial Area	4.7	7.5	NaN	NaN	NaN	NaN

In [3]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 435742 entries, 0 to 435741
Data columns (total 13 columns):
stn_code                       291665 non-null object
sampling_date                  435739 non-null object
state                          435742 non-null object
location                       435739 non-null object
agency                         286261 non-null object
type                           430349 non-null object
so2                            401096 non-null float64
no2                            419509 non-null float64
rspm                           395520 non-null float64
spm                            198355 non-null float64
location_monitoring_station    408251 non-null object
pm2_5                          9314 non-null float64
date                           435735 non-null object
dtypes: float64(5), object(8)
memory usage: 43.2+ MB
```

In [4]:

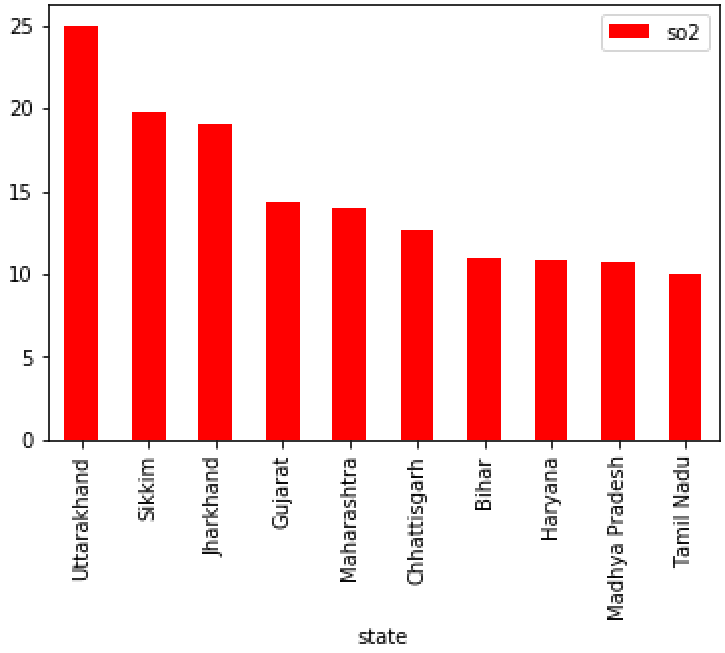
```
replacements = {
    'state': {
        r'Uttaranchal': 'Uttarakhand',
    }
}

data.replace(replacements, regex=True, inplace=True)
```

TOP 10

In [5]:

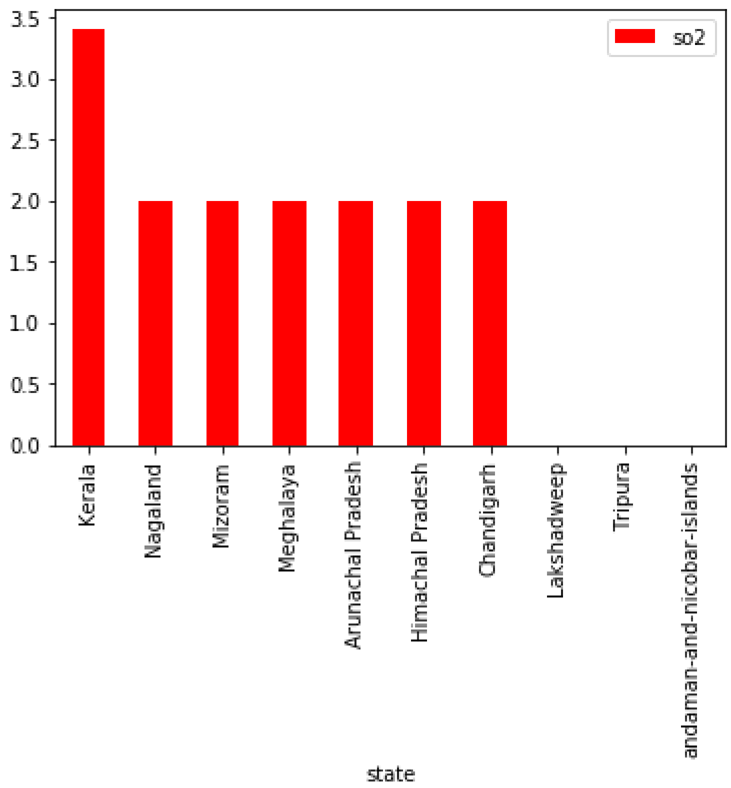
```
data[['so2','state']].groupby(["state"]).median().sort_values(by='so2',ascending=False).head(10).plot.
plt.show()
```



BOTTOM 10

In [6]:

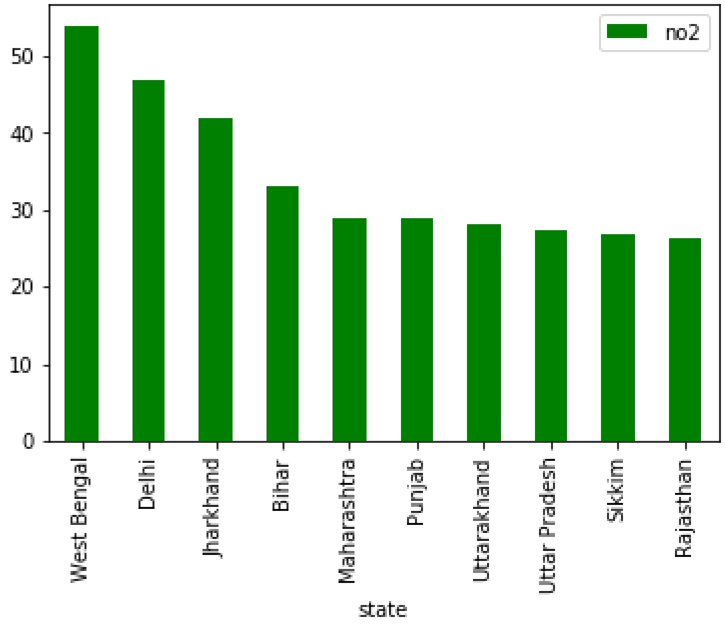
```
data[['so2','state']].groupby(["state"]).median().sort_values(by='so2',ascending=False).tail(10).plot.
plt.show()
```



TOP 10

In [7]:

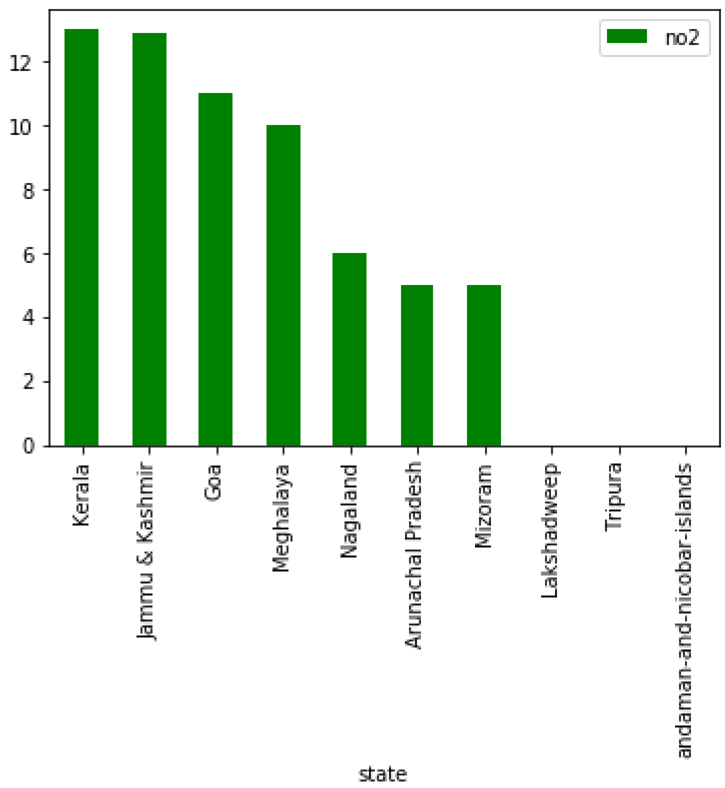
```
data[['no2','state']].groupby(["state"]).median().sort_values(by='no2',ascending=False).head(10).plot.
plt.show()
```



BOTTOM 10

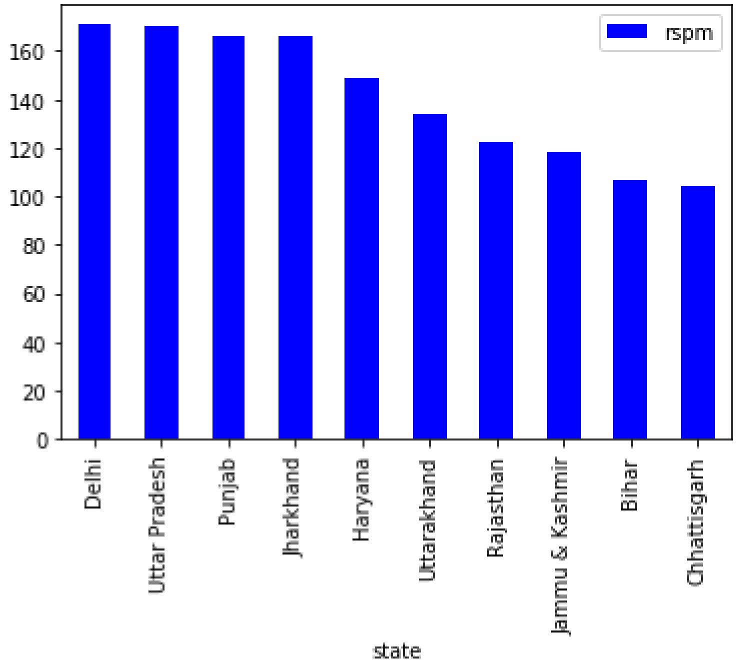
In [8]:

```
data[['no2','state']].groupby(["state"]).median().sort_values(by='no2',ascending=False).tail(10).plot.
plt.show()
```



TOP 10

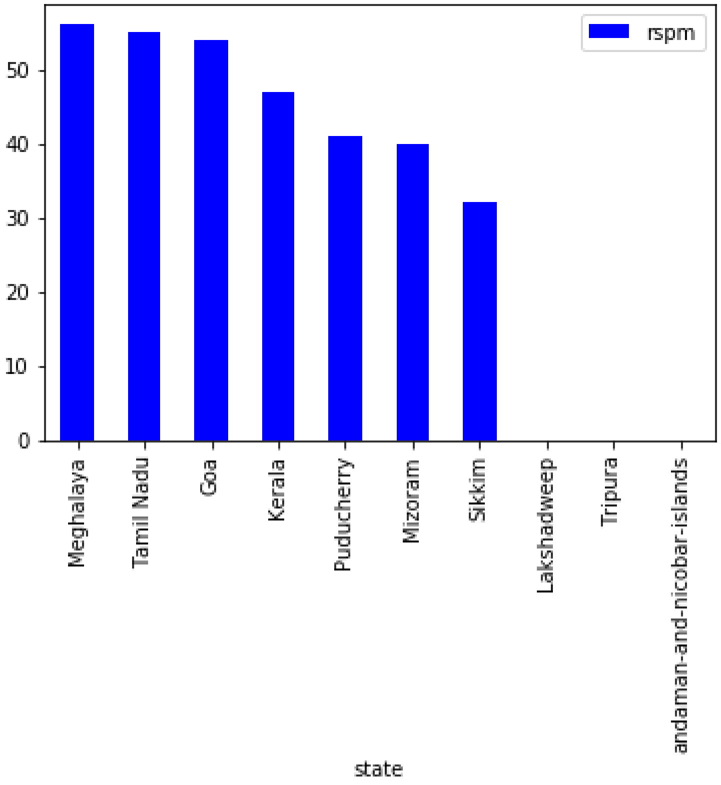
```
In [9]:  data[['rspm','state']].groupby(["state"]).median().sort_values(by='rspm',ascending=False).head(10).plo
         plt.show()
```



BOTTOM 10

In [10]:

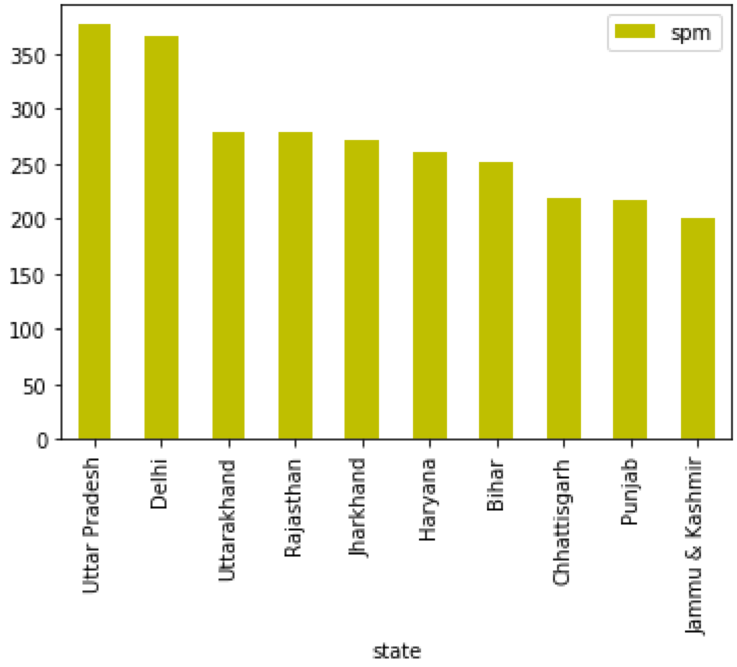
```
data[['rspm','state']].groupby(["state"]).median().sort_values(by='rspm',ascending=False).tail(10).plo
plt.show()
```



TOP 10

In [11]:

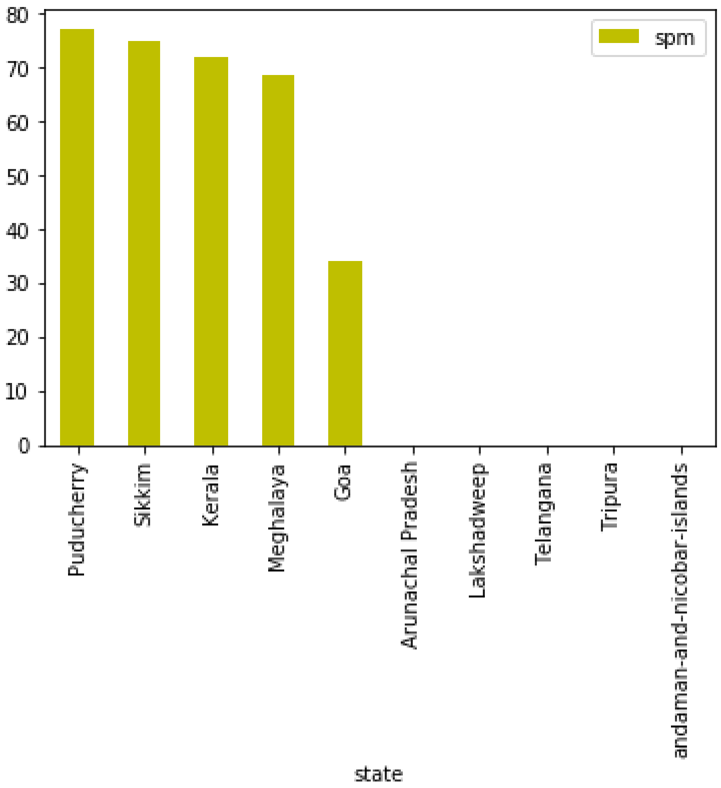
```
data[['spm','state']].groupby(["state"]).median().sort_values(by='spm',ascending=False).head(10).plot.
plt.show()
```



BOTTAM 10

In [12]:

```
data[['spm','state']].groupby(["state"]).median().sort_values(by='spm',ascending=False).tail(10).plot.
plt.show()
```

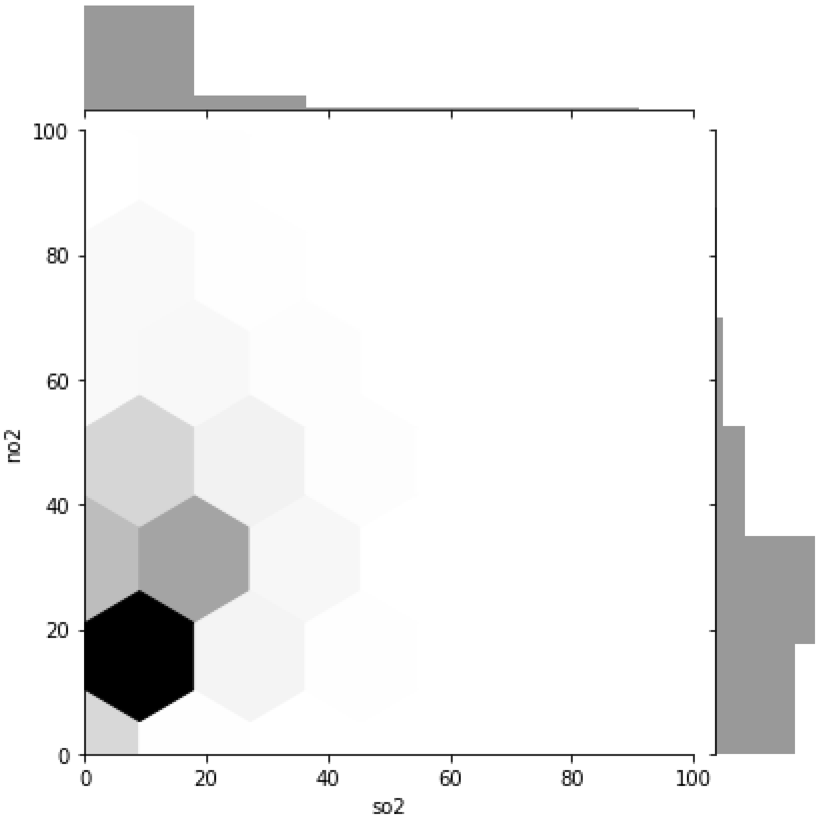


In [13]:

```
#Exploring relationship between proportion of Sulphur dioxide & Nitrogen dioxide
#sns.lmplot(x='so2',y='no2',data=data)
sns.jointplot(x='so2', y='no2', data=data,kind='hex',color='k',xlim={0,100}, ylim={0,100})
```

Out[13]:

```
<seaborn.axisgrid.JointGrid at 0x7f7a999be9b0>
```



In [14]:

```
data['date'] = pd.to_datetime(data['date'],format='%Y-%m-%d') # date parse
data['year'] = data['date'].dt.year # year
data['year'] = data['year'].fillna(0.0).astype(int)
data = data[(data['year']>0)]
```

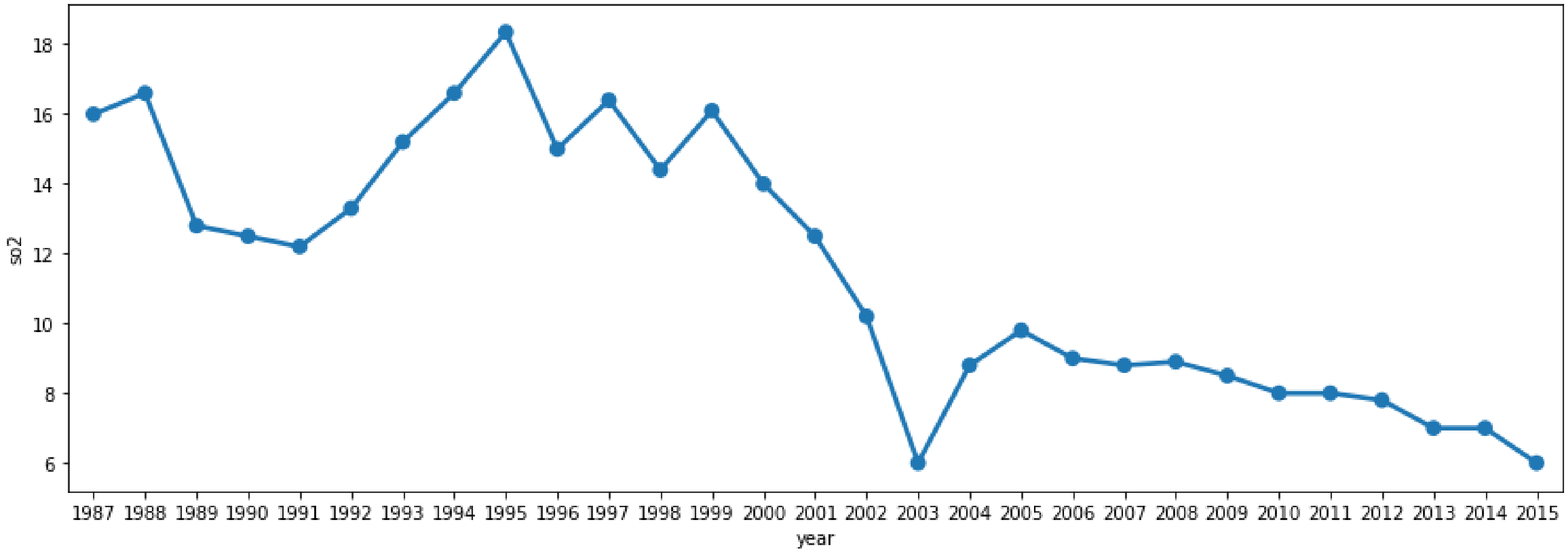
SO2 Analysis

In [15]:

```
df = data[['so2','year','state']].groupby(["year"]).median().reset_index().sort_values(by='year',ascer
f,ax=plt.subplots(figsize=(15,5))
sns.pointplot(x='year', y='so2', data=df)
```

Out[15]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7a975db208>
```



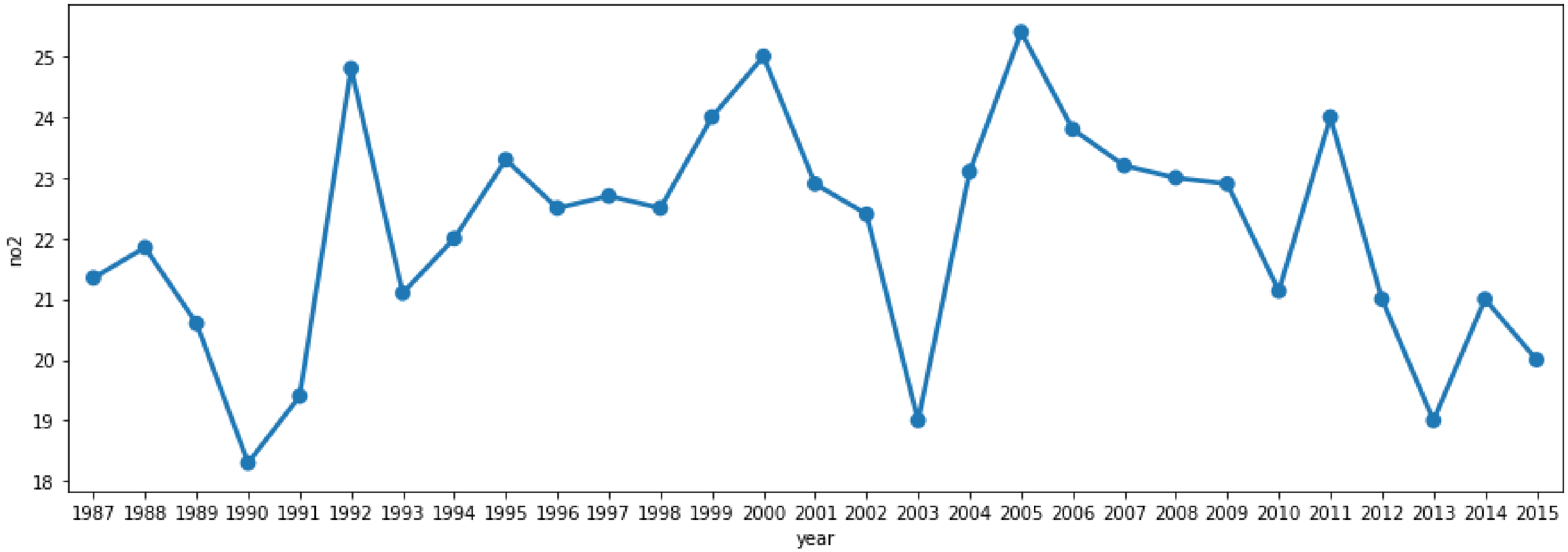
**NO2 Analysis

In [17]:

```
df = data[['no2','year','state']].groupby(["year"]).median().reset_index().sort_values(by='year',ascer
f,ax=plt.subplots(figsize=(15,5))
sns.pointplot(x='year', y='no2', data=df)
```

Out[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7a90c69d68>
```


no2
year